REMARKS

Claims 1-33 were pending in the present application. By virtue of this response, claims 1, 10, 19, 30, 32 and 33 have been amended. Accordingly, claims 1-33 are currently under consideration.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

Response to Prior Art Rejections

Claims 1-5, 9-14, 18-23 and 29-31 stand rejected under 35 U.S.C. § 102(b), as allegedly being anticipated by Major et al. (U.S. Patent No. 5,689,123). Claims 30, 31 and 33 stand rejected under 35 U.S.C. § 102(e), as allegedly being anticipated by Sugiura et al. (U.S. Patent No. 6,204,084). Claims 1, 6-8, 10, 15-17, 19 and 26-28 stand rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over Sugiura et al. in view of Major et al.

Before addressing the cited references, Applicant addresses the Examiner's attention to the claim amendments presented herein. Claims 1, 10 and 19 have all been amended to recite "supplying a nitrogen source material without pre-cracking to a crystal surface . . ." It is recognized that this feature may be considered to not have literal basis in the specification and that, therefore, addition of this feature would violate the written description requirement of 35 USC §112, first paragraph. However, as discussed below, it is respectfully submitted that such a position would be incorrect.

In this regard, Applicant directs the Examiner's attention to MPEP §2173.05(i). In particular, in this MPEP section, it is discussed with citation to the *Ex Parte Parks* case that "a lack of literal basis in the specification for a negative limitation may not be sufficient to establish a prima facie case for lack of descriptive support." More particularly, in *Ex Parte Parks*, the patentee amended a claim to add the phrase that a decomposition is conducted "in the absence of a catalyst." The Board of Patent Appeals and Interferences noted that the added phrase was

supported even though the specification did not literally refer to the absence of a catalyst. The Board specifically stated "Throughout the discussion [of the process] which would seem to cry out for a catalyst if one were used, no mention is made of a catalyist."

Similarly, in the present application, the discussion would seem to "cry out" for pre-cracking if such were used. Notably, no mention is made of pre-cracking. Thus, for reasons similar to those applied by the Board in *Ex Parte Parks*, it is respectfully submitted that adding the phrase "without pre-cracking" does not violate the written description requirement of 35 USC §112, first paragraph.

We now discuss the cited references. The Major reference discloses crystal growth of a III-V group compound semiconductor including As and N, and including Al. In particular, the Major reference describes a crystal growth method for simultaneously supplying an Al source and a N source, a crystal growth method for alternatively supplying an Al source and a N source, a LP-MOCVD or MBE method employing NH_3 Or $H_2N_2H_2$ as a N source, and growth of a mixed crystal material and device construction for use in a light emitting device of optional composition having long wave-length (As-rich) to short wave-length (N-rich) on the optional substrate including GaAs.

However, claims 1 to 29 include the element of forming a compound semiconductor layer wherein N source material is supplied onto the crystal surface including Al, or at the same time as an active Al material. This promotes the decomposition reaction of the N source material, as described in the specification at, for example, page 25, lines 1 to 5. The incorporation efficiency of N into the crystal and the light emitting property are greatly improved. Also, these advantages can be obtained in the case of employing a N source material having a particle shape as recited in claim 4.

In other words, employing the method recited in the claims, a crystal of good quality can be obtained upon generating a sufficient decomposition reaction by means of Al on the crystal surface. This is possible even if N source material is supplied without pre-cracking (such as a gaseous phase reaction with heat, plasma, or other gas in advance).

On the contrary, in the Major reference, the supplying performance of the source material to the substrate is totally different from that of the claimed method. In the Major reference, there is disclosure o£ supplying an N source material to the substrate upon generating a disassociation reaction -- corresponding to pre-cracking -- to catalyze in advance, by supplying NH_3 as the N source material together with PH_3 and AsH_3. This is described at, for example, col. 12, line 17 to col. 12, line 22 of the Major reference. Further, Major discloses supplying an N source material to the substrate upon causing pre-cracking in order to improve disassociation, by means of high pressure ovens, an electron-cyclotron resonator and heated effusion ovens. This is described, for example, at col. 13, line 26 to col. 13, line 32 of the Major reference.

The methods disclosed by Major are, thus, different from the method recited in the claims. Namely, in the Major reference, the N source material simultaneously supplied with Al is an N source material which causes pre-cracking. This appears to be essential to the methods described in the Major reference. But, the method recited in the claims employs an N source material to be supplied -- without pre-cracking -- to make a disassociation which is greatly promoted by A1, which is supplied together with or existing on the surface. Such a feature is neither disclosed nor suggested by the Major reference.

With specific regard to claims 30 and 31, it is respectfully submitted that Major does not dissolve the range now recited in these claims, namely "wherein an Al-mix crystal ratio X in the layer is 0.2 or higher and 0.20 or lower."

In the obviousness rejection, the Examiner also employs the Sugiura reference. However, the Sugiura reference is not relied upon for disclosing a relationship of supplying the aluminum source material with supplying the nitrogen source material. Rather, the Major reference is relied upon by the Examiner for this disclosure. However, as discussed extensively above, the Major reference fails to disclose or suggest the "without pre-cracking" feature of the method recited in Applicant's claims. Thus, the combination of Sugiura and Major fails to yield the subject matter of Applicant's amended claims.

Claims "Objected To"

Applicant appreciates the Examiner's indication that claims 24, 25 and 32 include allowable subject matter. Claim 32 has been rewritten in independent form. As for claims 24 and 25, the ultimate base claim (claim 19) has been amended to include the "without pre-cracking" feature, as discussed above. For this reason, it is believed that these claims are allowable without being amended into to incorporate the limitations of the base claim and intervening claims.

CONCLUSION

Applicant has, by way of the remarks presented herein, made a sincere effort to overcome rejections and address all issues that were raised in the outstanding Office Action. Accordingly, reconsideration and allowance of the pending claims are respectfully requested. If it is determined that a telephone conversation would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, Applicant(s) petition(s) for any required relief including extensions of time and authorizes the Assistant Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 299002052200.

Respectfully submitted,

Dated: April 2, 2003 By: _____

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

The top two lines following claim 10 and located at the top of page 60 in the claims are to be deleted.

Claims 1, 10, 19, 30, 32 and 33 have been amended as follows:

1. (Twice Amended) A method for forming a compound semiconductor layer, comprising the step of crystal-growing a group III-V compound semiconductor layer containing at least nitrogen and arsenic as group V elements on a single crystal substrate,

wherein the step of crystal-growing the compound semiconductor layer includes the step of supplying an aluminum source material to the single crystal substrate concurrently with a nitrogen source material without pre-cracking.

10. (Twice Amended) A method for forming a compound semiconductor layer, comprising the step of crystal-growing a group III-V compound semiconductor layer containing at least nitrogen and arsenic as group V elements on a single crystal substrate,

wherein the step of crystal- growing the compound semiconductor layer includes the step of supplying a nitrogen source material without pre-cracking to the single crystal substrate so that the nitrogen source material interacts with aluminum at least on a crystal growth surface of the compound semiconductor layer.

19. (Amended) A method for forming a compound semiconductor layer, comprising the step of crystal-growing a group III-V compound semiconductor layer containing at least nitrogen and arsenic as group V elements on a single crystal substrate,

wherein the step of crystal-growing the compound semiconductor layer includes the step of supplying a nitrogen source material without pre-cracking to a crystal surface of the

compound semiconductor layer in a state where the group III atoms containing aluminum are exposed to the crystal surface.

30. (Twice Amended) A compound semiconductor apparatus, comprising at least one group III-V compound semiconductor layer containing at least aluminum as a group III element and containing at least nitrogen and arsenic as group V elements, wherein an Al-mix crystal ratio X in the layer is 0.02 or higher and 0.20 or lower.

32. (Amended) A compound semiconductor apparatus ~~according to claim 31~~, comprising at least one group III-V compound semiconductor layer containing at least aluminum as a group III element and containing at least nitrogen and arsenic as group V elements; and

wherein the compound semiconductor apparatus is a light emitting device including at least a light emitting layer, and the light emitting layer includes the compound semiconductor layer; and

wherein the light emitting layer is formed of $Al_xGa_yIn_{1-x-y}N_5As_{1-z}$ ($0 < x, y, z < 1$), wherein an A1-mix crystal ratio x in the light emitting layer is 0.02 or higher and 0.20 or lower.

33. (Amended) A compound semiconductor apparatus according to claim ~~31 or~~ 32, wherein the light emitting device further includes a cladding layer, a guide layer and/or a barrier layer formed of $A1_hGa_iIn_{1-h-i}As_jP_{1-j}$ ($h \geq 0$, $i > 0$, $j \geq 0$).